SOC
7170
.19

HARVARD UNIVERSITY

LIBRARY

OF THE

Museum of Comparative Zoology

E.D.S 678.7

VOL. 14 PART 5

DEC 28 1960

TRANSACTIONS

OF THE

SOCIETY FOR BRITISH ENTOMOLOGY

World List abbreviation: *Trans. Soc. Brit. Ent.*

Edited by
E. J. POPHAM, D.Sc., Ph.D., A.R.C.S., F.R.E.S.
Department of Zoology, The University, Manchester 13
N. D. RILEY, C.B.E., F.Z.S., F.R.E.S.
7 McKay Road, Wimbledon, London, S.W. 20

Assisted by:
A. E. Gardner, F.R.E.S.; J. W. Heslop Harrison, D.Sc., F.R.S., F.R.S.E.; Francis Hemming, C.M.G., G.B.E., F.R.E.S.; W. D. Hincks, D.Sc., F.R.E.S.; H. E. Hinton, B.Sc., Ph.D., Sc.D., F.R.E.S.; B. M. Hobby, M.A., D.Phil., F.R.E.S.; H. C. Huggins, F.R.E.S.; G. J. Kerrich, M.A., F.L.S., F.R.E.S.; H. B. D. Kettlewell, M.A., M.B., B. Chir., F.R.E.S.; O. W. Richards, M.A., D.Sc., F.R.S., F.R.E.S.

DATE OF PUBLICATION, 30TH NOVEMBER 1960

Copies may be purchased from the Publications Secretary,
Department of Entomology, The Museum, Manchester 13

Price 5s. post free

Published for the Society
by the British Trust for Entomology Ltd.

BRITISH TRUST FOR ENTOMOLOGY LTD.,
41 QUEEN'S GATE, LONDON, S.W.7.

LIST OF PUBLICATIONS FOR SALE (ALL PRICES ARE POST FREE)

TRANSACTIONS OF THE SOCIETY FOR BRITISH ENTOMOLOGY

GENERAL

A New Chapter in Zoological Nomenclature: The Reforms instituted by the Thirteenth International Congress of Zoology, Paris, July, 1948. By F. Hemming, 1950. 8 pp., 1s. 6d.

The Problem of stability in Specific Nomenclature, with special reference to cases where type material is no longer in existence. By F. Hemming, 1951. 16 pp., 2s. 0d.

Some adaptations of insects to environments that are alternately dry and flooded, with some notes on the habits of the Stratiomyidae. By H. E. Hinton, 1953. 20 pp., 3 figs., 5s. 0d.

The terms "Larva" and "Nymph" in Entomology. A summary of the views of W. E. China, H. Henson, B. M. Hobby, H. E. Hinton, T. T. Macan, O. W. Richards, T. Southwood, and V. B. Wigglesworth, followed by a review of The Terminology of Juvenile Phases of Insects by R. G. Davies, 1958. 10s. 0d.

ENTOMOLOGICAL FAUNA OF THE NEW FOREST SERIES

Introduction by J. Cowley, and Part 1, Odonata, by Lt.-Col. F. C. Fraser, 1950. 12 pp., 1s. 6d. Part 2, Neuroptera, by Lt.-Col. F. C. Fraser, 1951. 12 pp., 1s. 6d.

EPHEMEROPTERA

Descriptions of some Nymphs of the British Species of the Genus *Baëtis*. By T. T. Macan, 1950. 24 pp., 6 figs., 2 tables, 3s. 0d.

A Description of the Nymph of *Baëtis buceratus* with notes and a key to other species in the genus. By T. T. Macan, 1957. 8 pp., 3s. 6d.

The Life Histories and Migrations of the Ephemeroptera in a stony stream. By T. T. Macan, 1957. 28 pp., 12s. 6d.

ORTHOPTERA, Etc.

A Summary of the Recorded Distribution of British Orthopteroids. By D. K. McE. Kevan, 1952. 16 pp., 5s. 0d.

HEMIPTERA-HETEROPTERA

Contributions towards an Ecological Survey of the Aquatic and Semi-Aquatic Hemiptera-heteroptera of the British Isles.

Scottish Highlands and East and South England. By E. S. Brown, 1948. 45 pp., 7s. 6d.

The Ribble Valley (Lancashire South and Mid). By E. J. Popham, 1949. 44 pp., 1 map, 8s. 0d.

North-East Wales (Denbighshire and Merionethshire). By E. J. Popham, 1951. 12 pp., 2s. 6d.

The Hemiptera-Heteroptera of Kent. By A. M. Massee, 1954. 36 pp., 7s. 6d.

The Bionomics and Immature Stages of the Thistle Lace Bugs (*Tingis ampliata* H.S. and *T. cardui* L.; Hem., Tingidae). By T. R. E. Southwood and G. G. E. Scudder. 8s. 0d.

COLEOPTERA

The Aquatic Coleoptera of North Wales. By E. S. Brown, 1948. 15 pp., 1 fig., 1s. 0d.

The Aquatic Coleoptera of Wood Walton Fen, with some comparisons with Wicken Fen and some other East Anglian Fens. By F. Balfour-Browne, 1951. 36 pp., 4s. 6d.

TRANSACTIONS OF THE SOCIETY FOR BRITISH ENTOMOLOGY

VOL. 14 NOVEMBER 1960 PART V

The Taxonomy and Ecology of British Species of *Peripsocus* Hagen (Corrodentia, Pseudocaeciliidae)

By E. Broadhead, M.A., D.Phil., and B. Datta, M.Sc.

(Department of Zoology, Leeds University)

In a survey of the psocid fauna of larch (*Larix decidua* Mill.) in Yorkshire in 1954 by Broadhead (1958), many specimens of *Peripsocus* species, both adults and nymphs, were obtained. These were not reported in detail at that time, since they represented only a very small proportion (2%) of the total psocid population found on larch, during the latter half of the summer. Moreover, difficulties were experienced in the identification of the adults of two of the species and no descriptions of the nymphs existed. This material and a collection of *Peripsocus subfasciatus* from broom made by Professor O. W. Richards has allowed a taxonomic reassessment to be made of the four species concerned and has also provided information on their biology.

TAXONOMY

The genus *Peripsocus* is world-wide in distribution. It is, however, very inadequately known. Most of the described species occurring outside Europe and North America are known only from the type localities. Of the 48 known species, 5 are Nearctic, 4 Neotropical, 12 Ethiopian, 7 Oriental, 7 Australasian, and 13 are Palaearctic. The 8 European species are *alboguttatus* (Dalman, 1823), *phaeopterus* (Stephens, 1836), *subfasciatus* (Rambur, 1842), *didymus* Roesler, 1939, *parvulus* Kolbe, 1880, *reductus* Badonnel, 1943, *consobrinus* Pearman, 1951, and *umbrosus* Navas, 1911. These would all appear to be valid species, with the exception of *umbrosus,* which was insufficiently characterized by Navas. The first four are the commonest species of *Peripsocus* in this country. *P. parvulus* does not appear to have been recorded in Britain, since it was found in the New Forest by McLachlan (1890). *P. consobrinus* is known only from the type specimen captured in Somerset. *P. reductus* has not hitherto been recorded in Britain. Two females of this species, found in a ship's hold at Liverpool on South African logs on 28th January 1953, are probably to be regarded as introductions.

The taxonomy of 4 *Peripsocus* species, *phaeopterus, didymus, subfasciatus* and *alboguttatus,* is reviewed here. Previous descriptions give little or no information on the variation of the

characters used for specific diagnosis. Accordingly, in the following descriptions only those characters of absolute diagnostic value are included, and in the subsequent remarks attention is paid to their variation and to the variation of those characters, which may be used in a supplementary way for identification.

Adults

Peripsocus phaeopterus (Stephens, 1836)

Psocus phaeopterus Stephens, 1836, *Ill., Brit. Ent., Mand.,* **6**: 127.

Psocus nigricornis Stephens, op. cit.: 126 (*sec.* Hagen, 1866, *Stettin ent. Ztg.,* **27**: 236).

Peripsocus phaeopterus McLachlan, 1867, *Ent. mon. Mag.,* 3: 273.

Peripsocus phaeopterus Kolbe, 1880, *Jber. westfäl. ProvVer. Wiss. Kunst,* **8**: 129.

Female

Forewing: uniformly suffused pale to medium brown with a slightly darker pterostigma.

Genitalia (fig. 5): 3rd valvula (=external valve of Badonnel) transversely rectangular, its length less than its breadth, its length much less than half the length of 2nd valvula.

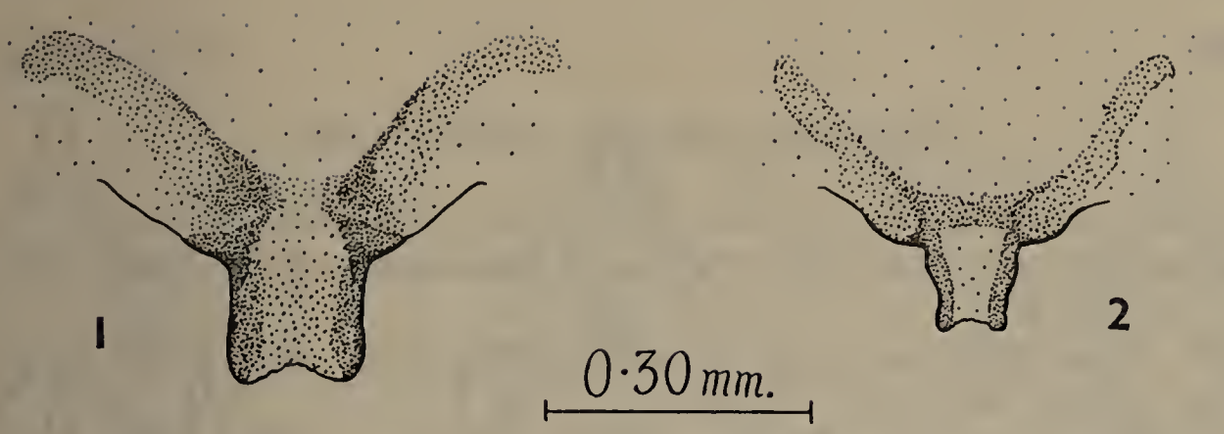
Subgenital plate (fig. 1): sides of median lobe sclerotized, straight and parallel or slightly diverging distad; posterior edge emarginate. Margin not convex at point of junction of median lobe with the rest of the subgenital plate.

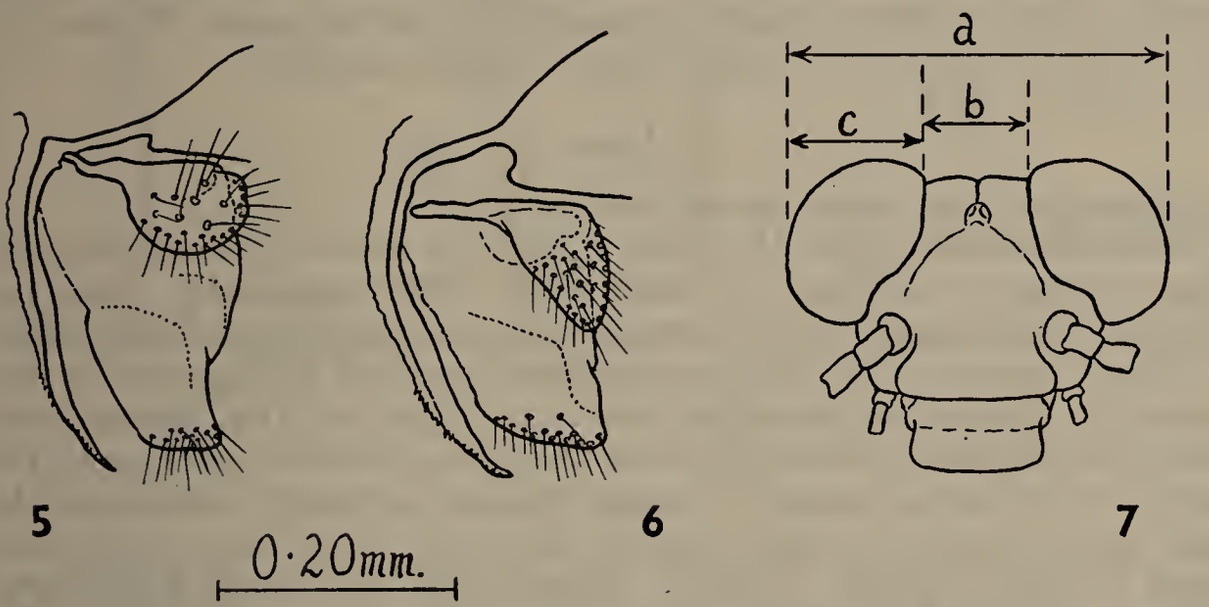
Male

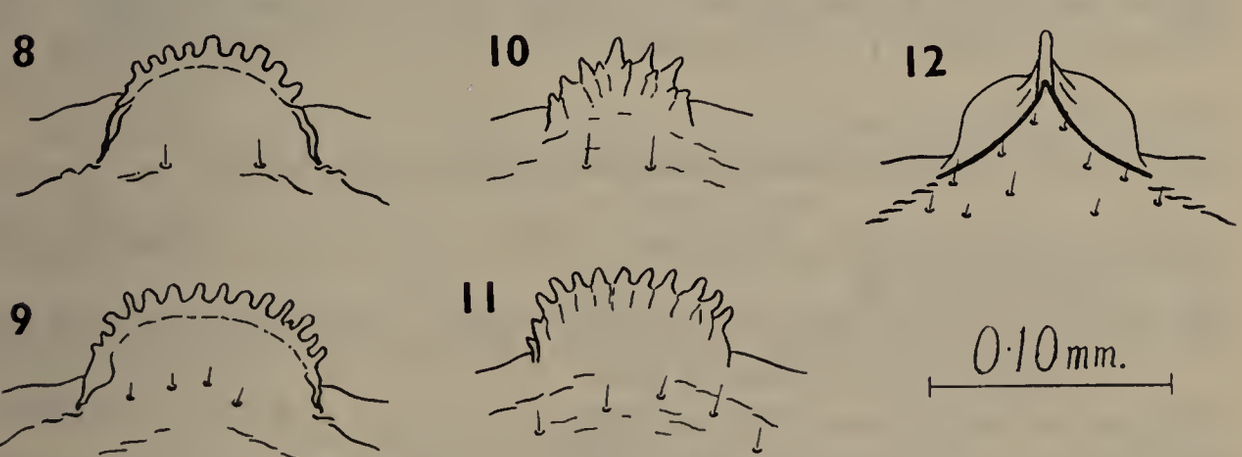
Forewing: uniformly pale brown with a slightly darker pterostigma.

Caudal comb (figs. 8, 9): with 9-15 teeth (17 specimens), these often uneven in size and always broadly rounded or truncate distally; these teeth without inwardly directed ridges at their bases and set on a narrow sclerotized margin.

Fork sclerite (fig. 13): not extending beyond the penial frame laterally. Cross bar stout, thicker than the prongs, and overlapping at each end the short curved sclerite at the base of the lateral prong. Lateral prongs straight throughout their whole length, their tips approaching each other closely or touching in the midline but not crossing each other. Median prong not extending backwards in midline as far as tips of lateral prongs. No sclerotized lateral projection from the side of the penial frame.







Figs. 1-4.—Subgenital plate of female (hairs not shown). 1, *Peripsocus phaeopterus*. 2, *P. didymus*. 3, *P. subfasciatus*. 4, *P. alboguttatus*.

Figs. 5-6.—Female genitalia. 5, *P. phaeopterus*. 6, *P. didymus*.

Fig. 7.—Head of male *P. didymus* to indicate measurements taken. a, head width. b, interocular distance. c, apparent eye diameter.

Figs. 8-12.—Caudal comb of male. 8, 9, *P. phaeopterus*. 10, 11, *P. didymus*. 12, *P. alboguttatus*.

Peripsocus didymus Roesler, 1939

Peripsocus didymus Roesler, 1939, *Zool. Anz.*, **125**: 170-2.

Peripsocus didymus s.sp. *truncatus* Badonnel, 1943, *Faune Fr.*, **42**: 93.

Peripsocus didymus s.sp. *silesiaca* Obr, 1948, *Sborn. Kl. prír, Brne,* **28**: 54.

Peripsocus truncatus Pearman, 1951, *Ent. mon. Mag.*, **87**: 88-9. *syn. nov.*

Female

Forewing: as *phaeopterus* female.

Genitalia (fig. 6): 3rd valvula elongate, its length almost twice its breadth, its length half or more than half the length of 2nd valvula, with hairs not restricted to apical third.

Subgenital plate (fig. 2): sides of median lobe sclerotized, usually sinuate and slightly converging distad; posterior edge shallowly emarginate. Margin usually convex at point of junction of median lobe with the rest of the subgenital plate.

Male

Forewing: as *phaeopterus* male.

Caudal comb (figs. 10, 11): with 7-12 teeth (14 specimens), these usually uniform in size and often gradually tapering distally; these teeth with inwardly directed ridges at their bases.

Fork sclerite (fig. 14): extending beyond the penial frame laterally. Cross bar slender, about as thick as the prongs, distinctly separated at its ends from the broad curved sclerite at the base of the lateral prong. Lateral prongs strongly curved at the base and usually curved distally as well, their tips cross each other in the midline. Median prong long, extending backwards up to or beyond the point of crossover of lateral prongs. No sclerotized lateral projection from the side of the penial frame.

Peripsocus alboguttatus (Dalman, 1823)

Psocus alboguttatus Dalman, 1823, *Analecta Entomologica,* Holmiae: 98.

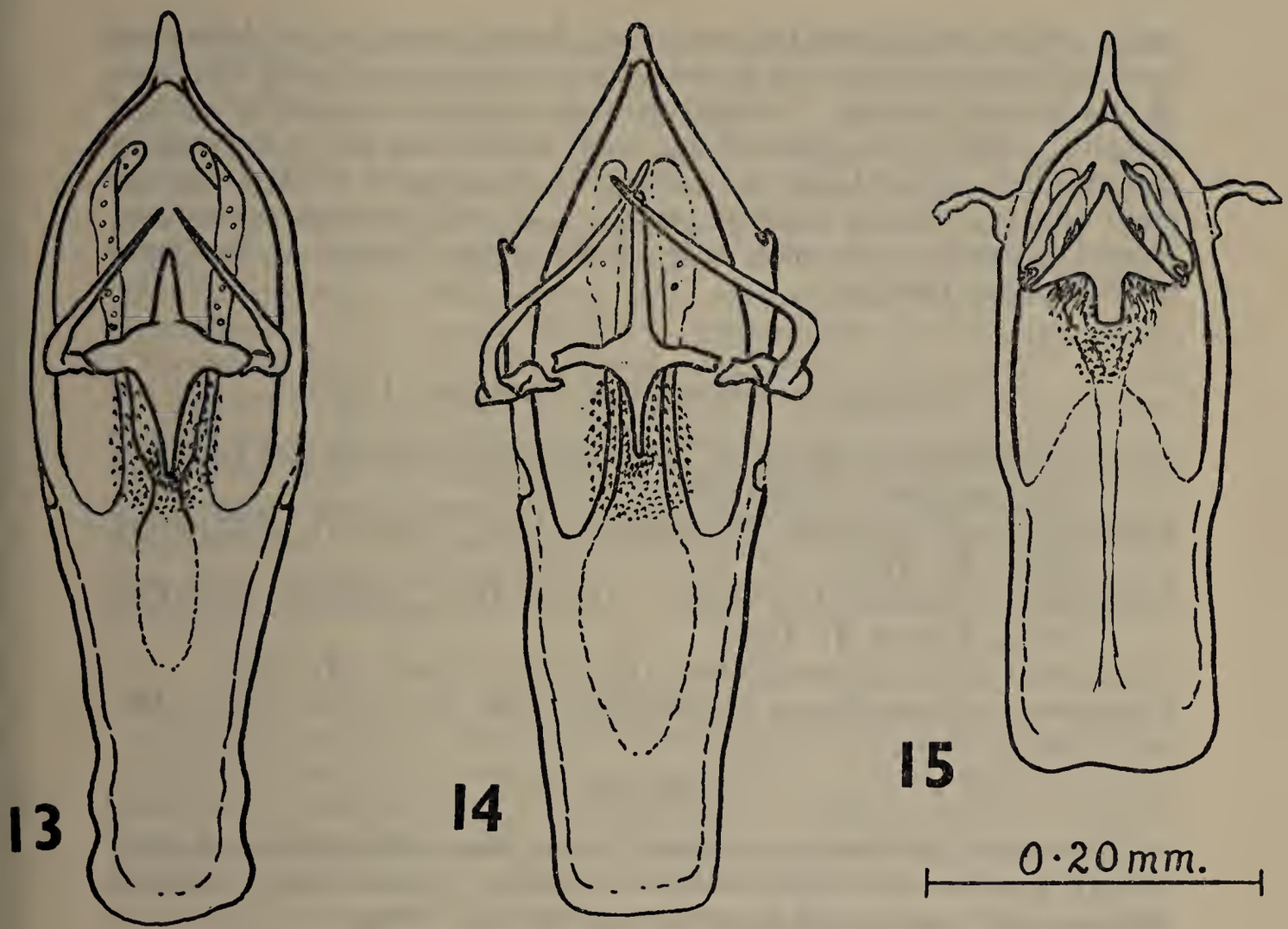
Psocus pupillatus Dale in Walker, 1853, *List specimens Neur. Insects in Brit. Mus.*: 493.

Peripsocus pupillatus Kolbe, 1882, *Ent. Nachr.* **8**: 211.

Peripsocus alboguttatus McLachlan, 1867 (partim), *Ent. mon. Mag.*, **3**: 273.

Peripsocus alboguttatus Spängberg, 1878, *Ofversigt of Kongl. Vetenskapsakademiens Forhandlingar,* **35** (2): 27-8.

Peripsocus alboguttatus McLachlan, 1883, *Ent. mon. Mag.*, **19**: 182.



Figs. 13-15.—Male genital armature. 13, *P. phaeopterus*. 14, *P. didymus*. 15 *P. alboguttatus*.

Female

Forewing: colour not uniform, the dark patches in apical cells each enclosing an unpigmented area; in well pigmented wings these dark patches clearly separated from each other by paler areas bordering the veins.

Genitalia: 3rd valvula in shape as *didymus* female and only slightly shorter relative to 2nd valvula (dorsal valve of Badonnel), but with the hairs restricted to apical third.

Subgenital plate (fig. 4): sides of median lobe not sclerotized, strongly converging distad and rounded apically. Margin not convex at point of junction of median lobe with the rest of the subgenital plate.

Male

Forewing: as female but paler throughout.

Caudal comb (fig. 12): represented by a single median broad based pointed tooth extending backwards over base of epiproct.

Fork sclerite (fig. 15): not extending beyond the penial frame laterally. Cross bar and median prong forming a single very

stout arrowhead-shaped sclerite; the basal point of the latter on each side overlapping the short narrow curved sclerite at the base of the lateral prongs. Lateral prongs straight or slightly curved distally, their tips approaching each other but not touching in the midline, and extending backwards as far as or a little further than the tip of the median prong. A well defined sclerotized lateral projection on each side of the penial frame at the level of the lateral prongs.

Peripsocus subfasciatus (Rambur, 1842)

Psocus subfasciatus Rambur, 1842, *Histoire naturelle des Insectes. Névroptères.* Paris: 322.
Peripsocus alboguttatus McLachlan, 1867 (partim), *Ent. mon. Mag.,* **3**: 273.
Peripsocus alboguttatus Kolbe, 1880, *Jber. westfäl. ProvVer. Wiss Kunst,* **8**: 130.
Peripsocus alboguttatus Kolbe, 1882, *Ent. Nachr.,* **8**: 211.
Peripsocus subpupillatus McLachlan, 1883, *Ent. mon. Mag.,* **19**: 183.

Female

Forewing: colour not uniform, paler than *alboguttatus* female —dark patches in apical cells not clearly defined, not enclosing unpigmented areas and confluent across the veins.

Genitalia: 3rd valvula similar in shape and relative size to that of *alboguttatus* but with hairs not restricted to apical third.

Subgenital plate (fig. 3): sides of median lobe broadly sclerotized and convex; posterior edge emarginate. Margin not convex at point of junction of median lobe with rest of subgenital plate.

This species appears to be entirely parthenogenetic. Males have never been recorded in the literature, and 117 specimens of this species collected from many parts of Britain were all females.

Remarks on main characters

The above characters in combination are adequate for the identification of any single individual of these species. Some of these characters vary considerably, however.

Females

The forewings of *phaeopterus* and *didymus* are indistinguishable in colour. Although usually a uniform brown, darker patches in the apical cells and in cells R and Cu are occasionally present, these resembling the wings of *consobrinus* as figured by Pearman (1951). The forewings of these three species lack the distinct round dark patch at the base of cell R_5, which is invariably found in the forewings of both *subfasciatus* and *alboguttatus*. The patterned wings of these two latter species differ from each other considerably in well pigmented specimens (figured by Badonnel, 1943).

Both wing pattern and the density of pigment vary greatly, however, in *alboguttatus,* and the very pale wings of the less pigmented specimens are very similar to the wings of some individuals of *subfasciatus*, the only consistent difference being the absence of unpigmented patches in the middle of the apical cells of the latter and their presence in the former species. The relative size and the shape of the 3rd valvula of the female genitalia distinguishes *phaeopterus* from the other three species. This character is only clearly visible in preparations of the gonopods compressed into one plane by the coverslip, since this valvula lies naturally at an angle to the plane of the rest of the genitalia, so that its optical length is much less than its actual length. The subgenital plate is distinctive in each of these four species, the descriptions being based on a study of uncompressed microscopic preparations. Compression produces considerable distortion, and this has resulted in the past in confusion about the identity of *truncatus* (see below).

Males

The caudal comb, which is an extension of the posterior border of the last tergum overlapping the base of the epiproct, is distinctive in *alboguttatus,* in which only a single median tooth is present. Most specimens of *phaeopterus* and *didymus* can be identified by means of this structure, but there is an overlap not only in the number of teeth but also in their shape. The broadly rounded or truncate teeth of *phaeopterus* vary little in the specimens of *phaeopterus* examined, but *didymus* is more variable in this respect, the teeth of some specimens being almost identical in shape to those in *phaeopterus.* Figs. 8, 9, and 10, 11 represent extreme conditions of the combs of *phaeopterus* and *didymus* respectively. The various features of the fork sclerite of the genital armature described above vary little and these provide the most reliable diagnostic characters for males. Compression under the coverslip in microscopic preparations easily displaces the fork sclerite in the penial frame and often alters the arrangement of the various parts.

A consideration of all these characters clearly points to the close relationship between *phaeopterus* and *didymus,* which is indicated particularly by the similarity in wing colour, in the general pattern of the subgenital plate and of the male genital armature and in the form of the caudal comb.

Remarks on supplementary characters

Other characters used in previous descriptions include body colour, venational features, forewing length and other measurements and the ratio of interocular distance and eye diameter. Almost all these show only a modal difference between the species. The slight differences between these four species in head and body colour are obscured by the variation within each species and are

unreliable for identification. On the other hand, the relative position of the fork of the radial sector with regard to the origin of vein m_2 in the forewing, although not absolutely diagnostic, does provide a useful additional character distinguishing, in part, *phaeopterus* from *didymus* (Table 1). The males of these two species are very similar in this character to their respective females. Metric characters are presented in Tables 2 and 3 with estimates of standard deviation (root-mean-square deviation of the items of the sample) and of the range of variation to be expected in a large population (mean ± 3 × standard deviation). The similarity between *phaeopterus* and *didymus* in head width, eye size and forewing length for both sexes emphasises the close relationship between these two species. The other point of interest concerns the ratio of interocular distance to apparent eye diameter as measured across the vertex (fig. 7). This ratio has been regarded by both Badonnel and Pearman as a useful diagnostic character for separating the males of *phaeopterus* and *didymus*. Badonnel (1943) gives values of 1·3 and $\leq$0·5 for these species respectively, and Pearman (1951) gives the values 1·23-1·30 and about 0·5, but the numbers of specimens examined are not indicated by them. It will be seen from Table 3 that, for males of these 2 species, the ranges of variation overlap for both the ratio and the eye diameter, but do not do so for interocular distance, which is, therefore, a much more reliable diagnostic feature than the ratio.

TABLE 1

Relative position of the fork of the radial sector with reference to the origin of m_2 in four *Peripsocus* species

		No. of individuals	Position of radial fork (%) proximally to m_2	opposite m_2	distally to m_2
P. phaeopterus	♀	94	20	53	27
	♂	26	35	46	19
P. didymus	♀	36	94	6	0
	♂	12	92	8	0
P. alboguttatus	♀	5	100	0	0
	♂	3	100	0	0
P. subfasciatus	♀	20	100	0	0

The identity of *Peripsocus truncatus*

Badonnel first described *truncatus* as a subspecies of *didymus* in 1943 by reference to two apparently distinctive features—the shape of the terminal lobe of the subgenital plate and the size of the 3rd valvula relative to the 2nd. He had available many female specimens but no males. Pearman (1951) raised this name to specific rank and re-described the female, from one specimen, by reference to these two characters and also to the position of the radial sector in the forewing. He also described the male.

Of the *Peripsocus* specimens collected from larch in Yorkshire,

TABLE 2

Female. Linear measurements of four *Peripsocus* species

	No. measured	Mean (M) (mm.)	Standard deviation (SD)	Calculated extremes (M ± 3 × SD)	Species
Width of head capsule	20	0·705	0·029	0·618-0·792	*phaeopterus*
	20	0·631	0·024	0·559-0·703	*didymus*
	20	0·589	0·013	0·551-0·627	*subfasciatus*
	5	0·605	0·016	0·557-0·654	*alboguttatus*
Interocular distance (IO.)	20	0·451	0·026	0·373-0·529	*phaeopterus*
	20	0·385	0·014	0·343-0·427	*didymus*
	20	0·385	0·011	0·352-0·417	*subfasciatus*
	5	0·401	0·018	0·346-0·456	*alboguttatus*
Apparent eye diameter (D.)	20	0·127	0·008	0·103-0·151	*phaeopterus*
	20	0·123	0·008	0·099-0·147	*didymus*
	20	0·102	0·003	0·093-0·111	*subfasciatus*
	5	0·102	0·006	0·084-0·120	*alboguttatus*
Ratio $\frac{IO.}{D.}$	20	3·56	0·30	2·65 -4·47	*phaeopterus*
	20	3·15	0·24	2·44 -3·86	*didymus*
	20	3·78	0·16	3·31 -4·24	*subfasciatus*
	5	3·95	0·36	2·87 -5·03	*alboguttatus*
Forewing length	20	2·88	0·10	2·58 -3·18	*phaeopterus*
	20	2·99	0·13	2·60 -3·38	*didymus*
	20	2·54	0·06	2·36 -2·72	*subfasciatus*
	5	2·15	0·06	1·98 -2·33	*alboguttatus*

TABLE 3

Male. Linear measurements of three *Peripsocus* species

	No. measured	Mean (M) (mm.)	Standard deviation (SD)	Calculated extremes (M ± 3 × SD)	Species
Width of head capsule	20	0·710	0·026	0·632-0·788	*phaeopterus*
	17	0·689	0·037	0·578-0·800	*didymus*
	6	0·553	0·011	0·520-0·586	*alboguttatus*
Interocular distance (IO.)	20	0·252	0·012	0·216-0·289	*phaeopterus*
	17	0·176	0·010	0·147-0·205	*didymus*
	6	0·261	0·017	0·210-0·312	*alboguttatus*
Apparent eye diameter (D)	20	0·229	0·017	0·178-0·280	*phaeopterus*
	17	0·256	0·021	0·195-0·318	*didymus*
	6	0·146	0·009	0·119-0·173	*alboguttatus*
Ratio $\frac{IO.}{D.}$	20	1·11	0·13	0·73 -1·49	*phaeopterus*
	17	0·69	0·08	0·45 -0·93	*didymus*
	6	1·80	0·20	1·20 -2·39	*alboguttatus*
Forewing length	20	2·98	0·12	2·62 -3·34	*phaeopterus*
	17	3·00	0·16	2·52 -3·48	*didymus*
	5	2·36	0·11	2·04 -2·68	*alboguttatus*

16 females were initially identified as *truncatus* and 20 females as *didymus* by the shape of the terminal lobe of the subgenital plate as figured by Badonnel. In these specimens the relative size of the 3rd valvula varied greatly, but showed no correlation with the differences observed in the subgenital plate. Further examination showed that most of this apparent variation resulted from different degrees of compression under the coverslip, since the 3rd valvula does not lie in the same plane as the other two valvulae, and that the relative size of this 3rd valve differed in no way in the *truncatus* and *didymus* specimens. Its actual length was about half that of the 2nd valvula in all the specimens, agreeing with Badonnel's description of *didymus,* its optical length varying with the degree of compression. The effect of compression on the shape of the terminal lobe of the subgenital plate is also appreciable. The main portion of this plate is convex in both longitudinal and transverse axes, the terminal lobe being convex in the transverse axis only. The mounts of the subgenital plates of the 16 *truncatus* specimens had been made with little or no compression, the shape of the terminal lobe (fig. 2) being the same as that figured by Badonnel for *truncatus*. The subgenital plates of the 20 *didymus* females were all, however, compressed and the terminal lobe corresponded in shape to Badonnel's and also Roesler's (1939) drawings for *didymus*. Compression of the subgenital plates of the *truncatus* specimens produced a change in shape to that figured by Badonnel for *didymus*. Thus it would appear that all these 36 specimens were conspecific. Moreover, all the males collected with these females agreed with Badonnel's diagnosis of *didymus*. *Truncatus* must then be regarded as a synonym of *didymus*. Further evidence for this synonymy is to be found in a comparison of measurements of the specimens initially identified as *truncatus* and *didymus* (Table 4). The difference between means is not significant at a 5% probability level for the interocular distance and for the ratio I0/D and only doubtfully so for the head width. Considering the three characters together, the measurements support the hypothesis that these two groups of individuals belong to the same population and so to the same species.

Pearman appreciated the distortion produced by compression of the subgenital plate, but evidently did not distinguish between the actual and the optical length of the 3rd valvula in describing the female of *truncatus*. His male *truncatus* would appear to be *phaeopterus* since all the characters described by him fall within the range of variation of this latter species. The subspecies *silesiaca* of *didymus* described by Obr (1948) appears to be insufficiently characterized as a separate form. The differences between females of this form and of *didymus*, given by Obr, are very slight and well within the range of variation found within a single population of the latter. Moreover, the males found associated with these females were found by this author to be typical *didymus*.

TABLE 4

Comparison of females of *P. didymus* and *"P. truncatus"*
Linear measurements of three characters

	No. of measure-ments	Mean (mm.)	Standard deviation	Standard error of mean	Species
Width of head capsule	20	0·637	0·019	0·004	*didymus*
	16	0·618	0·021	0·005	*truncatus*
Interocular distance	20	0·385	0·016	0·004	*didymus*
	16	0·369	0·016	0·004	*truncatus*
Ratio $\frac{\text{I0.}}{\text{D.}}$	20	3·03	0·14	0·03	*didymus*
	16	2·95	0·15	0·04	*truncatus*

Nymphs

The *Peripsocus* nymphs in the collection of psocids from larch were easily recognised by the short and rounded clypeus when the head was viewed from above. The pale to medium brown body colour without any clearly defined colour pattern and the presence on the abdomen of only very short and fine hairs not normally visible at low magnifications also distinguish the nymphs from those of *Elipsocus,* which they resemble more closely than the nymphs of other psocids. From each of 14 localities, adults of only one *Peripsocus* species were recorded (Table 7), either *phaeopterus* or *didymus* or *alboguttatus.* The last instar nymphs associated with these adults were assumed to belong to these species respectively, and the nymphs were selected from only those localities where the adult-nymph ratio in the sample was relatively high. The mean head width for last instar female nymphs of each group was 0·633 mm. (16 individuals) for *phaeopterus,* 0·593 mm. (N = 18) for *didymus,* and 0·524 mm. (N = 26) for *alboguttatus.* The correspondence in size order of the three species for nymphs and for adults suggests that these nymphs had been for the most part correctly separated to species. An extensive search, however, revealed no reliable character distinguishing *phaeopterus* from *didymus* nymphs, or these from female *alboguttatus* nymphs, although these are somewhat smaller than the former. Last instar male *alboguttatus* nymphs could be identified by the single toothed caudal comb, which was quite undeveloped in the male last instar nymphs of *phaeopterus* and *didymus.*

ECOLOGY

The distribution of *Peripsocus* species in Britain

Locality records for the species of *Peripsocus* in the literature are very few. *P. alboguttatus* and *subfasciatus* are not common species and the recognition of *didymus* in 1939 as a species distinct from *phaeopterus* invalidates the locality records for this latter

species before this date. In the course of general collecting for psocids from many kinds of trees by one of us (E.B.) in various parts of the country since 1941, a large number of *Peripsocus* specimens has been obtained, and a collection of psocids from broom at Silwood Park, Berkshire, by Professor O. W. Richards has also provided a number of records. The total numbers of the four species found are recorded in Table 5. This gives a reasonable indication of the relative abundance of these species in

TABLE 5

Total captures of four *Peripsocus* species from many kinds of trees in various parts of Britain, 1941-1958

Species	No. of species records	No. of specimens female	male	Total number	% of total *Peripsocus*
phaeopterus	45	333	114	447	68·5
didymus	19	61	18	79	12·1
subfasciatus	25	117	0	117	17·9
alboguttatus	7	6	4	10	1·5
Total	96			653	100·0

TABLE 6

Total captures of four *Peripsocus* species from four regions in Britain (the proportional representation of the species in each region, expressed as a percentage, is given in parentheses)

	North (Aberdeen)		Midland (Yorkshire)		South-East (near London)		South-West (Devon)	
phaeopterus	233	(87)	150	(77)	16	(15)	48	(60)
didymus	34	(13)	40	(20)	0		5	(6)
subfasciatus	0		0		90	(82)	27	(34)
alboguttatus	0		6	(3)	4	(3)	0	

Britain. *P. phaeopterus* is by far the commonest and *P. alboguttatus* is very rare. Since 84 of the 117 specimens of *subfasciatus* were obtained from broom at Silwood Park, where it appears to be exceptionally abundant, the estimate of relative abundance for this species (17·9% of total *Peripsocus*) is probably much too high for the country as a whole. The localities from which these collections were made may be grouped into four regions: North—near Aberdeen, from birch and various conifers; Midland—in Yorkshire, almost entirely from larch; South-East—near London, from various deciduous trees; and South-West—in Devon, from both conifers and deciduous trees. Table 6 records the total captures from each of these four regions, which give an indication of the relative abundance of the four species in each area, and the proportional representation of the species within

TABLE 7

The altitudinal distribution and relative abundance of three *Peripsocus* species on larch at twenty-four localities, 8 August-24 September 1954

	Altitude (feet)	Numbers of adults: *phaeopterus*	*didymus*	*albogut-tatus*	Number of samples	Average No. of adults per sample: *phaeopterus*	*didymus*	Average No. of *Peripsocus* per sample (adults and nymphs)
Sand Hutton	100	3	—	—	36	0·08	0·00	0·3
Plompton	200	—	—	—				
Aberford	200	—	—	—				
Bramham I	250	—	—	—				
Bramham II	200	—	—	—				
Bretton	300-450	—	—	—	44	1·07	0·50	7·1
Harewood	350-400	—	—	—				
Ripley	300-350	6	—	—				
Denton	350	4	—	—				
Studley	250-300	—	7	—				
Tanfield	300	37	15	—				
Bolton	500	4	—	—	20	3·15	0·65	11·5
Skipton	550	—	—	—				
Thorlby	500	—	—	2				
Gargrave	500	59	—	—				
Yearsley	500	—	13	—				
Fewston	600	3	—	—	18	1·50	0·28	7·9
Thruscross	700-750	24	—	—				
Barden	750-800	—	—	—				
Ampleforth	750	—	5	—				
Druids	900	—	—	1				
Witton Fell	1050	—	—	2	16	0·06	0·00	1·6
Bradfield	1100	—	—	—				
Malham Tarn	1250-1300	1	—	—				
	Total	141	40	5				

each region, which allows a comparison of the four areas. Again, for the reason mentioned above, the figure for *subfasciatus* for the South-East is to be regarded as an exaggerated one for purposes of comparison. The virtually exclusive collecting from larch in Yorkshire does not invalidate comparison with the other three regions in which larch is only slightly represented. The proportional representation of the species on larch over all four regions (*phaeopterus* 73·7% *didymus* 18·4%, *subfasciatus* 5·1%, and *alboguttatus* 2·8%) is in fact very similar to that for all other kinds of trees combined (excepting broom), namely 80·0%, 13·4%, 6·3% and 0·3% respectively. *P. phaeopterus* is generally the commonest species. It is indeed the commonest species in the South-East if the collections from broom be excluded. *P. didymus* is also generally distributed but is much rarer in the South-East, if not entirely absent there. Pearman, however (1951) records it (under the name *truncatus*) from Harpenden, Hertfordshire. *P. subfasciatus* is fairly common in the South of England but would appear to be absent in the North of England and in Scotland. The figures for *alboguttatus* are too small to permit any general remarks on its distribution.

The distribution and abundance of *Peripsocus* species on larch in Yorkshire

A survey of the psocid populations on larch in 1954 (Broadhead, 1958) covered 24 widely separated localities on the eastern slopes of the Pennines and in the Vale of York. At each locality, samples from immature, unbrashed stands of larch, 30-40 years old, were taken by beating the branches in a standardized way with a walking stick. The insects so dislodged fell on to a cloth tray held closely beneath and were sucked up into a tube and preserved in alcohol. The amount of larch branch covered by the walking stick held diagonally across it and regarded as one unit was repeatedly struck to dislodge as many of the insects as possible. Twenty such units comprised one sample. Samples were taken in pairs, one of each pair from the terminal portions of the living branch usually at the edge of a group of trees, and the other from the dead branches of the same trees usually just within the canopy. Successive pairs of samples were taken from widely separated points in each plantation. The survey occupied about six weeks during August and September when the *Peripsocus* species were, for the most part, in the adult and late instar nymphal stages. Such stages were not found in a second survey in the early summer (27th June - 5th July) of the following year, so that it seems likely that they have only one generation a year and that they overwinter in the egg stage.

Three *Peripsocus* species were present in these larch plantations, *phaeopterus* and *didymus* being relatively common and *alboguttatus* very rare. The numbers of adults of each species at each locality are recorded in Table 7, and density indices are given for the localities grouped into 5 categories of altitude

ranging from 100-200 ft. above sea level to 1,000-1,300 ft. The gradient in altitude is associated with a corresponding gradient in climate, rainfall increasing from a mean annual value of about 25 in. at the lowest localities to about 60 in. at the highest, Malham Tarn. *P. phaeopterus* and *P. didymus,* so closely allied taxonomically, show a similar pattern of distribution and abundance with respect to altitude. Densities of both species are lowest at the low and high localities and highest at altitudes of about 500 ft. In each altitudinal group, *phaeopterus,* however, is present at a greater density than *didymus.*

TABLE 8

The habitat preferences of *Peripsocus phaeopterus* and *P. didymus.* Numbers of individuals taken from living and from dead branches of larch

		Numbers captured from:	
		living branches	dead branches
Adults	*phaeopterus*	99	5
	didymus	2	23
Nymphs	*phaeopterus*	235	20
	didymus	8	39

Numbers on living and on dead larch branches are compared in Table 8. Those for *phaeopterus* are the total captures from the eight localities where *phaeopterus* is the only *Peripsocus* species recorded. Similarly, the figures for *didymus* represent the total captures from the three localities where adult *didymus,* but no adult *phaeopterus,* were found. The nymphs from these two groups of localities are assumed to belong to *phaeopterus* and *didymus* respectively. Since equal numbers of samples were taken from living and from dead branches, the numbers of specimens on these two parts of the larch tree are comparable. *P. phaeopterus* is much more abundant on living branches than on dead ones, and *didymus* is much more frequent on the dead branches. Thus, although the distributions of these two species are very similar in the Pennine region with respect to altitude, their habitats on the larch tree are different.

The sex ratios amongst the adults in this collection are similar to those recorded in Table 5. The last instar nymphs, sexed by reference to eye size, numbered 150 females and 147 males, suggesting that the sexes emerge as adults in approximately equal numbers, so that the relative scarcity of adult males in the field is probably due to the greater longevity of the females.

The natural foods of *Peripsocus* species

The crop contents of 28 *phaeopterus* females and 23 *didymus* females from various larch plantations have been examined, and the relative proportions of the various food constituents assessed

by the method described by Broadhead (1958: 231). No lichen was seen in any of these individuals. Small amounts (up to about one-eighth of the total contents) of bark and structureless black detritus particles were always present. The chief food constituents were in all cases *Pleurococcus* and fungal spores. The proportions varied considerably in different individuals, but these two foods were present in about equal amounts in three *phaeopterus* and ten *didymus* individuals taken from the same trees at Tanfield at the same time. These two species do not differ significantly therefore in their feeding preferences.

The collection of psocids from broom in 1956 has been reported on recently by Richards and Waloff (1958). The crop contents of the six commonest species have been examined. These are *Amphigerontia bifasciata* (Latr.) (49 examined), *Peripsocus subfasciatus* (Ramb.) (27), *Elipsocus hyalinus* (Steph.) (35), *Philotarsus picicornis* (Fab.) (9), *Caecilius flavidus* Steph. (6) and *Elipsocus westwoodi* McL. (2). All these species had been eating the same foods and in about the same proportions, viz., *Pleurococcus* and fungal spores in roughly equal amounts together with small quantities of bark flakes and detritus particles. The three species of *Peripsocus* examined do not therefore differ from each other in their feeding habits.

Acknowledgments

We wish to express our thanks to Professor O. W. Richards for the gift of a psocid collection from broom.

References

Badonnel, A. 1943. Psocoptères. *Faune Fr.*, **42**: 1-164.

Broadhead, E. 1958. The psocid fauna of larch trees in northern England—an ecological study of mixed species populations exploiting a common resource. *J. anim. Ecol.*, **27**: 217-263.

Kolbe, H. 1880. Monographie der deutschen Psociden, mit besonderer Berücksichtigung der Fauna Westfalens. *Jber. westf. ProvVer. Wiss. Kunst*, **8** (1879-1880): 73-142.

McLachlan, R. 1890. Two species of Psocidae new to Britain. *Ent. mon. Mag.*, **1** (2nd series): 269-270.

Navas, L. 1911. Notas entomológicas 3. Excursiones por los alrededores de Granada. *Bol. Soc. aragon. Cienc. nat.*, **10**: 204-211.

Obr, S. 1948. Contribution à la connaissance d'espèce de *Peripsocus didymus* Roes. (Psocoptères). *Sborn. Kl. prîr. Brne*, 28: 54-56.

Pearman, J. V. 1951. Additional species of British Psocoptera. *Ent. mon. Mag.*, **87**: 84-89.

Richards, O. W. and Waloff, N. 1958. Psocoptera captured on broom at the Imperial College Field Station, Silwood Park, Berks. *Ent. mon. Mag.*, **94**: 150.

Roesler, R. 1939. Beiträge zur Kenntnis der Copeognathenfauna Deutschlands. *Zool. Anz.*, **125**: 157-176.

LEPIDOPTERA

List of the Lepidoptera of Dorset. Part 2. By W. Parkinson Curtis, 1947. 138 pp., 4 pls., 11s. 0d.

Postural Habits and Colour-Pattern Evolution in Lepidoptera. By M. W. R. de V. Graham, 1950. 16 pp., 4 pls., 4 figs., 4s. 0d.

The Life History and Behaviour of *Coleophora alticolella* Zell. By A. M. Jordan, 1958. 16 pp., 10s. 0d.

HYMENOPTERA

The Hymenoptera Aculeata of Bedfordshire. By V. H. Chambers, 1949. 56 pp., 3 maps, 10s. 0d.

An Introduction to the Natural History of British Sawflies. By R. B. Benson, 1950. 98 pp., 9 pls., 10s. 0d.

Notes on Some British Myrmaridae. By W. D. Hincks, 1950. 42 pp., 5 figs., 1 pl., 5s. 0d.

The British Species of the Genus *Ooctonus* Haliday, with a Note on some Recent Work on the Fairy Flies (Hym., Myrmaridae). By W. D. Hincks, 1952. 12 pp., 8 figs., 4s. 0d.

The Natural History of some *Pamphilius* Species (Hym., Pamphiliidae). By V. H. Chambers, 1952. 16 pp., 4 pls., 5s. 0d.

A Study of some British Species of *Synergus*. By J. Ross, 1951. 16 pp., 4s. 0d.

A Revision of Section I (Mayr, 1872) of the Genus *Synergus* (Hym., Cynipidae) in Britain, with a Species New to Science. By R. D. Eady, 1952. 12 pp., 4 pls., 4s. 0d.

The British Ants Allied to *Formica fusca* L. (Hym., Formicidae). By I. H. H. Yarrow, 1954. 16 pp., 8 figs., 3 maps, 5s. 0d.

The British Ants Allied to *Formica rufa* L. (Hym., Formicidae). By I. H. H. Yarrow, 1955. 48 pp., 58 figs., 1 map, 10s. 6d.

Keys to the British Genera and Species of Elachertinae, Eulophinae, Entedontinae and Euderinae (Chalcoidea). By M. W. R. de V. Graham, 1959, 36 pp., 12s. 6d.

A Contribution to the Biology and Taxonomy of the British Species of the Genus *Eudecatoma* Ashmead (Eurytomidae). By M. F. Claridge, 1959. 20 pp., 7s. 0d.

The British Species of the Genus *Alaptus* Haliday in Walker (Chalcidoidea Mymaridae). By W. D. Hincks, 1959. 12 pp., 7s. 6d.

Notes on Pteromalidae (Chalcidoidea) with descriptions of New Genera and Species. By M. W. R. de V. Graham, 1959. 16 pp., 7s. 6d.

A Key to the Species of Ants (Formicidae). B. C. A. Collingwood, 1958. 28 pp., 10s. 6d.

Systematic Notes on British and Swedish Cleonymidae, with Description of a New Genus (Chalcidoidea). By G. J. Kerrich and M. W. R. de V. Graham, 1957. 48 pp., 15s. 0d.

DIPTERA

An Outline of a Revised Classification of the Syrphidae (Diptera) on Phylogenetic Lines. By E. R. Goffe, 1952. 28 pp., 3 figs., 6s. 0d.

A Revision of the British (and notes on other) Species of Lonchaeidae (Diptera). By J. E. Collin, 1953. 28 pp., 3 pls., 3 figs., 6s. 0d.

The Distribution and Habits of the British Conopidae (Dipt.). By Kenneth G. V. Smith, 1959. 20 pp., 10s. 6d.

Notes on the Identification of *Limnophila* Larvae (Tipulidae). By Allan Brindle, 1958. 12 pp., 5s. 0d.

A Short Synopsis of the British Scatophagidae. By J. E. Collin, 1958. 20 pp., 7s. 6d.

A Review of the British Subfamilies and Genera of the Family Muscidae. By E. C. M. D'A. Fonseca, 1956. 16 pp., 6s. 0d.

ORDERS, accompanied by the appropriate remittance, should be addressed to DR. W. D. HINCKS, Manchester Museum, Manchester 13.

CONTENTS.

BROADHEAD, E., and DATTA, B. The Taxonomy and Ecology of British Species of *Peripsocus* Hagen (Corrodentia, Pseudocaeciliidae).

T. BUNCLE AND CO. LTD., ARBROATH.

MCZ ERNST MAYR LIBRARY
3 2044 148 058 738

Date Due